J. Environ. Nanotechnol.
Volume 3, No.4 (2014) pp. 54-57
ISSN (Print): 2279-0748
ISSN (Online): 2319-5541
doi: 10.13074/jent.2014.12.144113

Seasonal Variation in Physico-Chemical Parameters of Surface Water and Ground Water of Singanallur Lake, A Rivulet from River Noyyal

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Received: 08.08.2014 Accepted: 11.11.2014

Abstract

The present study is carried out to assess the water quality parameters of both surface water and ground water of singanallur lake region a rivulet from river Noyyal. Parameters like pH, FC, DO, BOD, Turbidity, Total phosphates, Nitrates and Total dissolved solids are measured and compared for both summer and rainy season. Results revealed parameters varied to greater extent for surface water compared to ground water. So the surface water of singanallur region is highly polluted due to runoff from industries, domestic waste and agricultural lawns.

Keywords: *Noyyal river; Physico-chemical standards; Singanallur lake.*

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1. INTRODUCTION

Noyyal River originates from the majestic Vellingiri hills a part of Western Ghats.After making its way through a distance of about 160 km, Noyyal merges with Kaveri River near Kodumudi. It is also home to major dams like Aathupalayam Dam (Vellakoil) and Orathuppalayam (Chennimalai). Coimbatore is flanked by Noyyal River and its various meandering canals and tanks.The water usage of this river was an efficient system that provided required water transport and storage along with maintaining stable groundwater stages.it experiences perennial flow in some extends and occasionally flood occurs after heavy rain. There are about 34 rivulets united to river Noyyal. Singanallur Lake is one of the rivulets of river Noyyal and is situated at a distance of 17.5 km from the river basin. The present study attempts to evaluate the physico-chemical parameters of surface water and ground water of Singanallur Lake and their WQI is compared for summer and rainy season (2012-2013).

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2. STUDY AREA

Singanallur lake is situated at the right side of the Coimbatore. Its catchment area is 11.776 sq.miles, water spread area 1.153 sq.km with maximum flood discharge of 100.95 cu.secs. It has a capacity is 52.27 m.cft with a depth of 13.95 feet.It has three inlets: a canal from river Noyyal, Sanganur drain and sewage outlet from Kallimadai area.

3. MATERIALS & METHODS

3.1 Collection of water samples

Surface water samples from the lake andground water samples from the wells of near-by irrigated lands of the river are collected for 2 season's namely rainy period 2012 (Oct to Dec) and summer season 2013 (April to June).

3.2 Physico-Chemical parameters

The parameters such a pH and total dissolved solids are measured in the field using portable water monitoring kit. Dissolved oxygen is determined by

Winklers method with Azide modification. BOD is determined by five days method. Total Dissolved solids are measured with the help of evaporation and calculation methods. (Hem, 1991). Amount of total phosphates and nitrates are measured by using UV-Visible method.The turbidity is evaluated by using Digital Turbidity meter, 863D 'Bio-Chem make. Multiple-tube fermentation method is used to find out the amount of fecal coliform bacteria present. All the analysis are carried out as per the standard methods of water and wastewater examination [APHA].

3.3 pH

An important measure of water quality is its pH. The pH values of surface water and ground water for both the seasons (summer and rainy) ranged between 7.1 -7.6 indicating the water is slightly alkaline. The alkaline nature of water is due to input of ammoniacal compounds from city sewage.The mild alkaline nature suggests that approximately 95 % CO_2 in water is present as bicarbonate. This is favored by the finding of Azeez *et al.* (2000).

3.4 Dissolved Oxygen

Percentage saturation of oxygen is a boon to aquatic life. When the concentration of DO in water is in equilibrium with oxygen it is 100% saturated. So dissolved oxygen content is considered to be one of the important measures of water quality for both surface water and ground water (Jammel, 1998). Saturation level of oxygen is low in surface water during summer season (84.54 %) than during rainy season (87.17 %). Whereas in ground water the saturation level of DO is high. [97.35 % during rainy and 95.20 % during summer]. The reason is during summer season water level slows down so it mixes less with air and DO concentration decreases.

3.5 Fecal Coliform

Fecal coliform may occur in ambient water as a result of the run-off of domestic sewage or from non-point sources of human and animal feces. So it is an important indicator of water pollution. Fecal coliform level for ground water is 1.20 MPN/100 ml during summer and 1.42 MPN/100 ml during rainy season. For surface water it is 37.10 MPN/100 ml during rainy season and 133 MPN/100 ml during summer season.The level of FC is especially high during summer season due to direct discharge of human and animal waste into the water.

3.6 BOD

Biochemical oxygen demand indicates the amount of dissolved oxygen consumed by microbes incubated in darkness for five days at 20 °C. Higher the amount of BOD higher will be the amount of pollution in water.Studies revealed the BOD level of ground water is 3.20 mg/l during rainy season and 3.60 mg/l during summer season. BOD level of surface water is 4.84 mg/l during rainy season and 7.50 mg/l during summer. BOD level is high in summer due to microbial breakdown, which uses surplus oxygen and is often concentrated in summer.

3.7 Turbidity

Turbidity can be inferred as a measure of the relative clarity of water. High levels of suspended sediment often results in reduced rates of photosynthesis. Ground water is turbid up to 1.10 NTU during rainy season and 1.50 NTU during summer season. Whereas in surface water turbidity is high 14 NTU during rainy season and 16 NTU during summer. Turbidity increases sharply during rainy season due to runoff from agriculture activities and maximum flood discharge into the lake. Increase in turbidity during summer season is due to construction activities occurring near the lake without erosion control practices.

3.8 Total Phosphates

Total phosphates of ground water during rainy season is 0.20 NTU and for surface water is 1.35 NTU. During summer season total phosphate is 0.54 NTU for ground water and 2.10 NTU for surface water. Maximum level of phosphates during summer season is due to maximum runoff from fertilized lawns, cropland and human activities.

3.9 Total Nitrates

Total nitrates constitute 1.4 mg/l for ground water during rainy season and 1.6 mg/l during summer season. For surface water it is 3.90 mg/l during rainy season and 4.40mg/l during summer season. The natural level of nitrates in surface water exceeds up to 4 mg/l for both the seasons indicating pollution by animal or human waste or fertilizer runoff. Seasonal variations in ammonia concentrations are due to varying rates of organic loading and natural decayHalldeg GR (1989).

3.10 Total Dissolved Solids

Total solids measurements can be useful as an important water quality parameter due to the effects

Table 1. Calculation and Results of Water Quality Index (WQI)

Singanallure Ground water (Rainy Season-2012)						
Sl.No	**Parameters**	**Results**	**Units**	**Q value**	**Weighing factor (W)**	**Sub total (QxW)**
1	DO	97.35	% saturation	99	0.19	18.81
2	FC	1.2	MPN/ 100ml	97	0.18	17.46
3	pH	7.37	pH units	93	0.12	11.16
4	BOD	3.2	mg/l	66	0.12	7.92
5	P	0.2	NTU	92	0.11	10.12
6	N	1.4	mg/l	96	0.11	10.56
7	Turbidity	1.1	NTU	96	0.09	8.64
8	TDS	663	mg/l	20	0.08	1.6
					Overall WQI =	86.27

Table 2.Calculation and Results of Water Quality Index (WQI)

Singanallure Ground water (Summer Season-2013)						
Sl. No	**Parameters**	**Results**	**Units**	**Q value**	**Weighing factor (W)**	**Sub total (QxW)**
1	DO	95.2	% saturation	98	0.19	18.62
2	FC	1.42	MPN/100ml	95	0.18	17.1
3	pH	7.68	pH units	91	0.12	10.92
4	BOD	3.6	mg/l	63	0.12	7.56
5	P	0.54	NTU	58	0.11	6.38
6	N	1.6	mg/l	95	0.11	10.45
7	Turbidity	1.5	NTU	95	0.09	8.55
8	TDS	792	mg/l	20	0.08	1.6
					Overall WQ I =	81.18

Table 3: Calculation and Results of Water Quality Index (WQI)

Singanallure Surface water (Rainy Season-2012)						
Sl.No	**Parameters**	**Results**	**Units**	**Q value**	**Weighing factor (W)**	**Sub total (QxW)**
1	DO	87.17	% saturation	93	0.19	17.67
2	FC	37.1	MPN/100ml	56	0.18	10.08
3	pH	7.59	pH units	92	0.12	11.04
4	BOD	4.84	mg/l	57	0.12	6.84
5	P	1.35	NTU	33	0.11	3.63
6	N	3.9	mg/l	72	0.11	7.92
7	Turbidity	14	NTU	69	0.09	6.21
8	TDS	365	mg/l	51	0.08	4.08
					Overall WQI =	67.47

Table 4: Calculation and Results of Water Quality Index (WQI)

Singanallure Surface water (Summer Season-2013)						
Sl. No	**Parameters**	**Results**	**Units**	**Q value**	**Weighing factor (W)**	**Sub total (QxW)**
1	DO	84.54	% saturation	90	0.19	17.10
2	FC	133	MPN/100ml	41	0.18	7.38
3	pH	7.35	pH units	93	0.12	11.16
4	BOD	7.50	mg/l	44	0.12	5.28
5	P	2.10	NTU	26	0.11	2.86
6	N	4.40	mg/l	68	0.11	7.48
7	Turbidity	16	NTU	66	0.09	5.94
8	TDS	450	mg/l	40	0.08	3.20
					Overall WQ I =	60.40

of runoff from construction, agricultural practices, sewage treatment plant discharges, and other sources (Agarwal, 2005). TDS for ground water is 663 mg/l during rainy season and 792 mg/l during summer season. For surface water it is 365 mg/l during rainy season and 450 mg/l for summer. TDS value is within the permissible limits.

4. CONCLUSION

The physicochemical and bacteriological analysis of the surface water samples of river Noyyalreveals WQI for surface water is very lowcompared to WQI of ground water for both rainy and summer seasons. Enrichment of nutrients leads to the eutrophication in river system and inversely affects the dissolved oxygen content of water. High level of TDS in water samples during summer season is attributed to discharge of salt content rich effluents from industries. Also other parameters prove that ground water quality is good andsafe for both drinking and irrigation.But surface water quality is fair and not safe for drinkingbut permissible for irrigation in sometypes of soil. The results also suggest surfacewater may be altered in future due to excess population, rapid industrialization and urbanization of this catchment area.

Hence our study concludes that the surface water quality of Noyyal river shows constant variation at different seasons and it is highly important to take periodical monitoring of surface water quality in this region for our future sustainability.

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